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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/002,862	11/15/2001	John Davis Holder	MEMC 01-0650 (3003)	4783

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SENNIGER POWERS LEAVITT AND ROEDEL
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EXAMINER	
SONG, MATTHEW J	
ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 10/14/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/002,862	HOLDER, JOHN DAVIS	
	Examiner	Art Unit	
	Matthew J Song	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 April 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-96* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-96* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *4/03/02* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement filed 3/14/2002 fails to comply with 37 CFR 1.98(a)(3) because it does not include a concise explanation of the relevance, as it is presently understood by the individual designated in 37 CFR 1.56(c) most knowledgeable about the content of the information, of each patent listed that is not in the English language. It has been placed in the application file, but the information referred to therein has not been considered. Item 12, DE 4201546, is not in English and does not have an English Abstract or an explanation of relevance.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 37-51, 60, 86-89 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 37 recites, "the wedge has a wedge angle that is about 180°" in lines 1-2. It is unclear what the wedge angle is referring to because the wedge is inherently a triangular shape and a triangle has 3 vertices.

4. Claims 52-58 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 52-58 recites, "each wedge on the exposed unmelted polycrystalline silicon does not substantially overlap with the immediately preceding

one". It is unclear because claim 7 implies multiple wedges, however Fig 7 illustrates a single wedge.

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 37 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 37 is interpreted by the examiner to mean that one of the angles of the wedge is 180°, which means the other angles are required to be 0°. The wedge is no longer a wedge, but a flat plane.

7. Claims 52-58 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 52 recites, "each wedge on the exposed unmelted polycrystalline silicon does not substantially overlap with the immediately preceding one". However, there is no divider or separation between wedges to prevent overlap, note instant Fig 6.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 1-96 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takase et al (US 6,423,137) or Takase et al (WO 99/46433), where US 6,423,137 is used as an accurate translation and an accurate translation can be provided upon request, in view of Holder et al (US 5,588,993) and Nagai et al (US 5,902,395).

Takase et al discloses a single crystal pulling apparatus comprising a feeder **21** into a crucible. Takase et al also discloses the raw material is fed from the feeder intermittently and not continuously so that the melt in the crucible overflows intermittently to increase overflow quantity. Takase et al also discloses the feed supplies solid grain like material ('137 col 4, ln 1-67).

Takase et al discloses intermittently feeding raw material to a crucible. Takase et al does not disclose forming a partially melted charge in the crucible and directing the flow of the feed onto the unmelted polycrystalline silicon.

In a method of preparing a molten silicon melt, note entire reference, Holder teaches polycrystalline silicon **10** is loaded into a crucible **20** and chunk poly crystalline silicon is used because using chunks avoids the formation of void defects (col 3, ln 35 to col 4, ln 2). Holder also teaches polycrystalline silicon **10** is melted until a partially melted charge forms in a crucible (col 4, ln 30-65). After forming the partially melted charge in the crucible, granular polycrystalline silicon **40** is fed onto the exposed

unmelted polycrystalline silicon (col 5, ln 1-60). Holder also teaches feeding the polycrystalline silicon **40** on the unmelted silicon **11** allows the silicon to dehydrogenate, which is desirable (col 5, ln 10-30). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Takase et al with Holder's chunk polysilicon because using chunk polysilicon reduces void defects (col 3, ln 65 to col 4, ln 2).

The combination of Takase et al and Holder does not teach rotating the crucible.

In a method of recharging a crucible in a Czochralski method, note entire reference, Nagai et al teaches feeding granular silicon material to an unmolten layer such that a constant thickness of the unmolten layer is maintained (col 5, ln 5-40). Nagai et al also teaches rotating the crucible to prevent clogging of the feed pipe (col 6, ln 1-15) It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Takase et al and Holder with Nagai's rotating crucible to prevent clogging the feed pipe.

Referring to claim 1, the combination of Takase et al, Holder and Nagai et al teach forming a partially melted charge comprising molten silicon and unmelted silicon ('993 Figs 2-4), rotating the crucible ('395 col 6, ln 1-15), feeding the polycrystalline silicon intermittently onto the exposed unmelted polycrystalline silicon ('395 col 5, ln 30-35; '137 col 4, ln 35-56; '993 col 5, ln 1-5) and melting the polycrystalline silicon and fed polycrystalline silicon to form a melt ('993 Abstract).

Referring to claim 3, the combination of Takase et al, Holder and Nagai et al teach a crucible with a diameter ('993 col 4, ln 15-20).

Referring to claim 4-5, the combination of Takase et al, Holder and Nagai et al teach the interface between the unmelted polycrystalline silicon and the upper surface of the molten silicon is approximately equidistant from the center of the unmelted polycrystalline and equidistant from the interior wall of the crucible ('993 Fig 3).

Referring to claims 6-8, the combination of Takase et al, Holder and Nagai et al teach 55 kg of chunk polycrystalline for a 100 kg total charge ('993 col 5, ln 5-15); therefore the percentage of chunk polycrystalline can be determined to be 55% (55/100), which reads on applicant's range of 50-60%.

Referring to claim 9-10, the combination of Takase et al, Holder and Nagai et al teaches the molten silicon comprises about 25-50% of the total surface area ('993 col 4, ln 45-65 and Figs 2-4), this reads on applicant's d ranges about 65%-85% of D.

Referring to claim 11-12, the combination of Takase et al, Holder and Nagai et al teach rotating the crucible at 1 rpm ('395 col 13, ln 20-25).

Referring to claim 13-14, the combination of Takase et al, Holder and Nagai et al teach rotating the crucible at 1 rpm ('395 col 13, ln 20-25), but does not teach rotating at about 2.1 rpm. The rate of crucible rotation is dependant on the flow rate of the feed pipe. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Takase et al, Holder and Nagai et al by optimizing the rotation speed of the crucible to obtain same by conducting routine experimentation of a result effective variable (MPEP 2144.05). Also, rotating a crucible at 2 rpm is well known in the art, note Nagai et al (US 5,868,835) below. Furthermore, the selection of reaction parameters such as temperature and concentration is obvious (In re Aller 105 USPQ 233, 255 (CCPA 1955)).

Referring to claim 15-18, the combination of Takase et al, Holder and Nagai et al teaches a feed rate of 5-15 kg/hr ('993 claim 14).

Referring to claim 19-31, the combination of Takase et al, Holder and Nagai et al is silent to the value of the f, t_{on} and t_{off} parameters. However, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Takase et al, Holder and Nagai et al by optimizing these parameters to obtain same by conducting routine experimentation (MPEP 2144.05).

Referring to claim 32, the combination of Takase et al, Holder and Nagai et al is silent to using an angle of repose valve. Angle of repose valves are conventionally used for granular materials in order to interrupt the flow of granular material. Angle of repose valves are well known in the art, as evidenced by Crawley (US 5,642,751) and Boone et al (US 5,205,998), below.

Referring to claim 33-34, the combination of Takase et al, Holder and Nagai et al teaches a vertical type feed tube so that it is not directly above the center of he exposed unmelted silicon ('993 Figs 2-4).

Referring to claim 35, the combination of Takase et al, Holder and Nagai et al teaches a feed is sprayed ('993 Fig 2-3), this reads on applicant's spray type feed tube.

Referring to claim 36-52, the combination of Takase et al, Holder and Nagai et al teach supplying granular polysilicon is a wedge that extends radially outward from about the center to the interface between the unmelted polycrystalline silicon and the upper surface of the molten silicon, note Holder Fig 3. Holder is silent to the angle of wedge, however Holder teaches polycrystalline silicon chunks with different angles, which granular silicon is supplied, where the polycrystalline chunks reads on applicant's wedge.

Figures 1-5 taught by Holder are identical to Figs 1-5 in the instant applicant. Therefore, because Holder teaches identical polycrystalline wedges, as applicant, the angles are inherently taught by Holder. Furthermore, changes in shape are held to be obvious (MPEP 2144.03).

Referring to claim 53-58, the combination of Takase et al, Holder and Nagai et al is silent to the position of wedges. However, the combination of Takase et al, Holder and Nagai et al teach a wedge ('993 Fig 3) and rotating a similar rate and flowing granular silicon intermittently, as applicant, therefore this is inherent to the combination of Takase et al, Holder and Nagai et al.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Ogure et al (US 5,820,649) teaches pelletized silicon material falls intermittently into a silicon melt (col 2, ln 55-65).

Barclay et al (US 5,569,325) teaches the addition of feed material over time can be carried out intermittently in which portion of the feed material are introduced at discreet intervals of time or continuously in which the feed material is being constantly metered.

Nagai et al (US 5,868,835) teaches rotating a crucible at 2 rpm while feeding silicon to silicon melt (col 5, ln 55-67).

Crawley (US 5,642,751) teaches angle of repose valves have typically been used for granular materials in order to interrupt the flow of granular material (col 1, ln 10-15).

Boone et al (US 5,205,998) teaches an angle of repose valve to block the flow for high purity silicon (col 1, ln 50-55 and col 2, ln 1-67).

Holder (US 5,919,303) teaches loading a crucible with chunk polysilicon and granular polysilicon (Abstact).

Fuerhoff (US 6,454,851) teaches a wedge and feeding granular polysilicon and feeding is controlled in response to the relative position to the sidewall of the crucible (Abstract).

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 703-305-4953. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 703-305-2667. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Matthew J Song
Examiner
Art Unit 1765

MJS

NADINE G. NORTON
PRIMARY EXAMINER